

Evaluation of Exposure Treatment of Burns

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WALLACE,^{5, 8} BLOCKER,^{2, 3} AND PULASKI⁷ in recent reports on the exposure treatment of burns stressed the saving in personnel, the need for fewer transfusions, decreased infection, comfort and freedom from pain for the patient, the necessity of fewer skin grafts and, for patients with less severe burns, a shorter hospital stay. In order to compare results with those reported, the authors (who had used the closed or occlusive dressing technique since it was introduced by Allen and Koch in 1942) treated thirty consecutive patients by the exposure method.

The exposure treatment of burns is not a new method. It was used to some extent more than fifty years ago. Some three years ago it was revived by Wallace of Edinburgh and since has been used extensively by Blocker and Pulaski in the United States. All of them have been enthusiastic in reports. More recently other investigators, including Evans,⁴ have compared the exposure method with the closed occlusive dressing and have been more conservative in their appraisal.

PRINCIPLES OF THE EXPOSURE METHOD

In the exposure method, the burned area is left exposed to the air without the application of any ointment or dressing. The basic principle of this method is the formation over the burned area of an eschar. This occurs within 18 to 36 hours after the burn is exposed to the air. The eschar acts as a natural dressing to protect the injured area while healing occurs in first and second degree burns and acts as a protective covering for full thickness damage. It serves as a temporary substitute for the normal epithelium and protects against invasion by infective organisms. While this dry eschar is present, bacteria fall upon it as they would on normal, intact skin; but because of absence of moisture and warmth the micro-organisms do not grow and multiply. Ideally, once the burn has been covered by the eschar the raw surface is never again exposed to the air until the area has healed or until the eschar is removed and skin grafting is performed. Wallace⁵ stressed the necessity of immobilization to avoid cracking or in any way disturbing the continuity of the protective eschar. However, immobilization is difficult

• For purposes of comparison with the occlusive dressing method of treating burns, the exposure method was used in 30 cases—16 of first and second degree and 14 of third degree. Attempt was made to simulate the conditions which might be expected to prevail in mass treatment of burned patients—inadequate personnel and materials. Elaborate measures to immobilize burned areas were not employed.

Healing of first and second degree burns was natural and the results satisfactory without further treatment. In third degree burns, skin grafting was necessary after the eschar was removed. Cracking of the eschar several days before time to remove it in some cases of third degree burns necessitated use of occlusive dressings in the last few days before skin grafting was done.

The exposure method is considered valuable in circumstances in which saving of time, material and personnel is indicated. Generally it is not suitable for treatment of encircling burns of the trunk or extremities, since maintaining the integrity of the eschar is extremely difficult in such situations.

and often impossible. By the use of specially constructed beds, plaster splints and suspension with calcaneal pins and fingernail traction, Wallace obtained satisfactory immobilization in certain cases. It is doubtful, however, whether the average physician treating burns would elect these somewhat extreme measures to obtain the necessary immobilization outlined by Wallace. Blocker and Pulaski deviated from the rigid standards of immobilization set up by Wallace and permitted considerable motion and ambulation once the eschars were formed. The amount of motion permitted and the area involved partly determine the time interval before cracks appear in the eschar. Despite these cracks Wallace and Blocker continued the exposure method, without turning to pressure dressings, until healing was complete or skin grafting was carried out.

METHOD AND RESULTS

Treatment of a fresh burn should begin with measures to relieve pain and shock. Morphine should be

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used sparingly; codeine or a barbiturate often will suffice. In children the use of morphine is contraindicated.

For a burn covering more than 20 per cent of the surface of the body, the authors immediately begin infusion of irradiated plasma or normal saline solution pending the cross-matching of blood for transfusion.

The quantities of colloid solution, electrolytes and water necessary to combat shock are estimated from the patient's weight and the per cent of surface area burned, according to the principles of Evans.⁴ During the first 24 hours 1 cc. of plasma or blood is administered per kilogram of body weight for each per cent of surface area burn. An equal quantity of electrolytes is given in the form of normal saline solution to correct dehydration owing to the shift of extracellular fluid into the damaged area. During the second 24 hours one-half of the above calculated fluid requirement is given. In addition, 5 per cent dextrose in water is given to provide the normal

daily water requirements for urine formation and insensible loss. If vomiting does not occur, the electrolyte and water requirements are best administered orally as a solution of 3 to 4 gm. of sodium chloride and 1.5 to 2 gm. of sodium bicarbonate per quart of water. In adults one of the best criteria of adequate control of shock is an hourly urinary output of 50 cc. The amount can readily be measured by using an indwelling Foley catheter.

Transfusions of whole blood are of great importance in treatment of severe burns. Extensive third degree burns can cause a reduction of as much as 50 per cent in the volume of circulating erythrocytes.⁶ During the first 48 hours one-half of the colloid solution should be in the form of blood. Frequent transfusions should be given thereafter to maintain hemoglobin content above 13 gm. per 100 cc. of blood.

Following is the procedure carried out in treating thirty patients by the exposure method: After adequate anti-shock therapy was initiated, all clothing, gross dirt, and ragged pieces of detached epithelium were removed in the simplest possible manner. Very few of the burns were washed with soap and water, and blisters, unless unusually large, were left intact. The patient was placed in bed on a clean but not necessarily sterile sheet in an open ward where the burns were exposed to the air. A sheet supported by a metal frame was used to protect the burned area while the eschar was forming. Depending somewhat on the temperature and comfort of the patient this was continued as long as necessary. Penicillin was administered parenterally in total daily doses of 300,000 to 600,000 units.

First and second degree burns (16 cases, with area of involvement ranging from 5 per cent to 30 per cent of the body surface) dried and a light brown

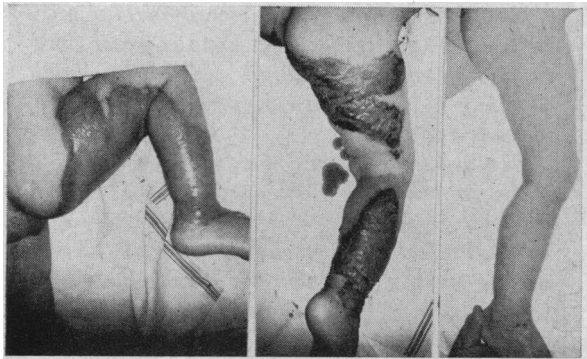


Figure 1.—*Left*, second degree burn with hot water on the day of injury. The patient was 17 months of age. *Center*, well formed eschar three days later. *Right*, complete healing 14 days after injury.



Figure 2.—*Left*, fresh burns of face and hands in explosion of gasoline. *Center*, eschars beginning to separate five days later. *Right*, 23 days after injury, only small areas of third degree burn remain unhealed.

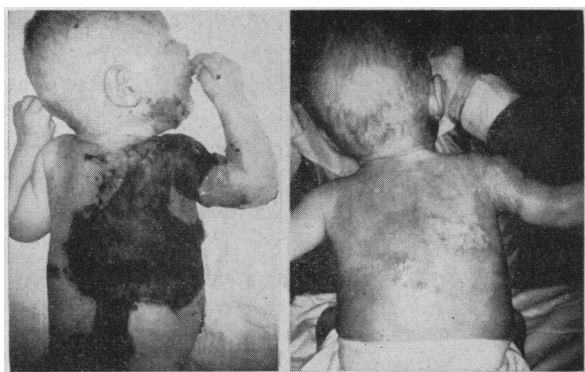


Figure 3.—*Left*, eschar 12 days after second and third degree burn with coffee. *Right*, after covering third degree areas with skin grafts.

eschar formed over the burn in 18 to 36 hours. During the next few days the eschar darkened, and in 7 to 18 days it gradually separated and fell off to reveal complete epithelial regeneration (Figure 1). As attempt was being made to simulate exposure care of the kind it was felt would be applied by the average physician, only simple methods to obtain partial immobilization were employed. For infants and younger children the only immobilizing devices used were arm, leg, and chest restraints to keep the proper area uppermost. Simple plaster splinting was devised for some of the older children; but for the most part they were allowed freedom of the bed. Although breaks and cracks developed in the eschar in a high proportion of cases, complete natural healing occurred in all instances (Figure 2). It was not necessary to abandon the treatment and use dressings in any of these cases. In no case was an area of partial skin destruction converted to full thickness loss due to infection.

Third degree burns. In the exposure treatment of third degree burns the entire eschar should be left intact for about three weeks, then removed and skin grafting performed immediately. In the 14 cases of third degree burns in the present series, the eschar usually cracked by the fourteenth to sixteenth day, and although the low humidity of the atmosphere in Southern California tended to dry the area rather quickly, the continuity of the protective eschar could not be adequately reestablished. This terminated the useful life of the eschar, whereupon wet, occlusive dressings were applied for two to four days, and skin grafting then was carried out (Figure 3). To have continued the exposure method in third degree burns after the appearance of breaks in the eschar would have risked converting a theoretically sterile burn into an infected wound. Signs of infection were absent in the exposure method as long as the eschar remained dry and without cracks. Rarely did the body temperature of a patient rise above 101° F.



Figure 4.—*Left*, encircling burn of leg on day of injury. *Right*, eschar eleven days later. Simple plaster splint utilized to immobilize knee and to hold leg off bed. *Lower*, after skin grafting.

and usually it was normal. With this method as with the pressure dressing method, close supervision is necessary to prevent neglect.

COMMENT

In children the nutritional state remains more nearly normal with treatment by the exposure method, largely because fear of painful changing of dressings and subsequent unwillingness to eat are eliminated. Better nutrition, the early use of whole blood transfusions to combat shock and the absence of the loss of blood entailed in changes of dressings helped to maintain the content of hemoglobin in the blood. However, frequent examination of the blood is as necessary as when any other form of therapy is used. The amount of skin grafting required is essentially the same as that needed when the pressure dressing method is employed.

Infants and young children should be hospitalized for the exposure method. Cooperative, intelligent

older children and adults can have minor burns successfully treated by the exposure method as ambulatory patients outside the hospital. The exposure method is limited by the distribution of the burn, but not by its depth or extent. It was impossible to obtain adequate eschars over circumferential burns of the trunk and quite difficult to obtain them in cases of encircling burns of the extremities (Figure 4). Generally the exposure method should not be used in such cases. The exposure method is readily adaptable to burns limited to one surface of the body. It is particularly useful in treating burns of the face and perineum, as pressure dressings are difficult to apply in those areas and rapidly become soiled.

CONCLUSIONS

In evaluating the exposure method of therapy it is inevitable that comparison be made with results obtained with the occlusive pressure dressing technique. Such comparison must be made on an equitable basis. A *properly applied* occlusive pressure dressing has been proved to be the most satisfactory dressing for burns. However, in the present series attempt was made to simulate the circumstances of the mass care of patients under the stress of abnormal conditions characterized by inadequate personnel and materials. That is the background for the following observations:

1. The exposure method is saving in time, material and personnel.
2. Ideal immobilization of the burned area is often impractical.
3. Satisfactory healing progresses with moderate motion and even ambulation.
4. Before skin grafting over third degree burns,

a few days of wet, occlusive dressings may be necessary.

5. Infection was minimal, and there was less pain or discomfort.

6. The amount of skin grafting required was not changed by the exposure treatment.

7. All infants and young children should be hospitalized.

8. Intelligent, cooperative adults and older children with minor burns may be treated without hospitalization.

9. Generally the exposure method should not be used for encircling burns of the trunk or extremities.

10. It is best adapted for burns of one surface of the body, the face and perineum.

11. Vigilance in the care of the patient and the burn is as necessary here as in other forms of treatment.

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